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Introduction

This plan describes a process for planning, conserving and developing water resources. The process has the flexibility to change elements of the plan as future conditions require.

3.1 Background

Utahns have always understood the importance of their water resources. Specific legislation to begin state water planning was passed in 1963. The Division of Water Resources published a series of documents, titled *State of Utah Water*, for the years 1962 to 1985. These contained basin inventories and descriptions of local and statewide problems.

The Division of Water Resources published the *State Water Plan* in January 1990. Sections 4 through 19 provide the foundation upon which Utah will build future water resources conservation and development programs and projects. Section 20 contains summaries of individual basin plans. Section 21 contains status reports, showing major changes and progress on resolving issues.

3.2 Planning Guidelines

The *State Water Plan* describes the basic premises and lays the foundation for state water planning. This insures continuity so individual basin plans will be consistent with the statewide plan and with each other.

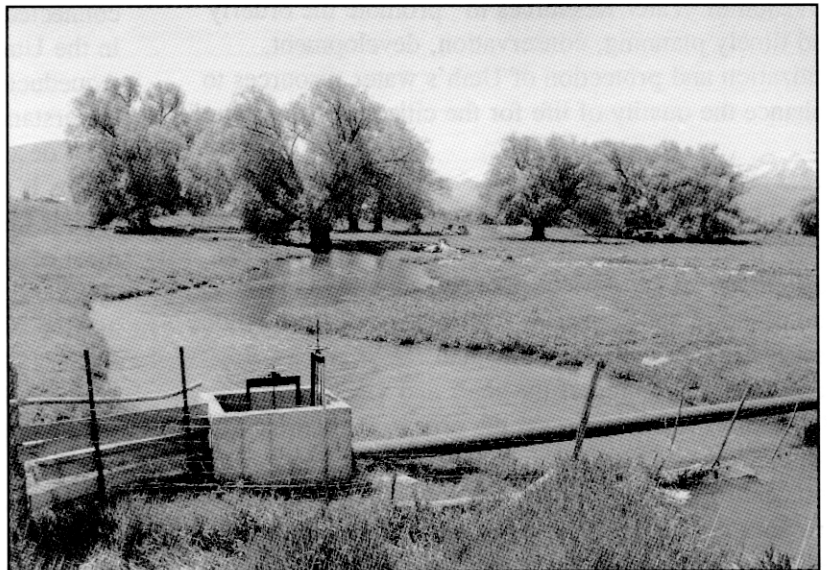
3.2.1 Principles

Many principles, values, uses and interests are considered when preparing a basin plan. Prominent ones are:

- All waters, whether surface or subsurface, are held in trust by the state as public property, and their use is subject to rights administered by the State Engineer. The doctrine of prior appropriation has governed Utah water law since statehood.
- Water is essential to life. It is our responsibility to leave good quality

water to meet the needs of the generations to follow.

- The diverse present and future interests of Utah's residents should be protected through a balance of economic, social, aesthetic and ecological values.
- Water uses for which beneficiaries are difficult to identify, such as recreation and aesthetics, should be included in program evaluation.
- Public participation is vital to water resources planning.
- All residents of the state are encouraged to practice water conservation and implement wise use practices.
- Water rights owners are entitled to transfer their rights under free market conditions.



Creek west of Heber City

- Water resources projects should be technically, economically and environmentally sound.
- Water planning and management activities of local, state and federal agencies should be coordinated.
- Local governments, with appropriate state assistance, are responsible for protecting against emergency events such as floods and droughts.
- Designated water uses and quality should be improved or maintained unless there is evidence the loss is outweighed by other benefits.
- Educating Utahns about water is essential. Effective planning and management require a broad-based citizen understanding of water's physical characteristics, potential uses and scarcity value.

3.2.2 Purpose

This basin plan will help coordinate the water-related activities of local, state and federal agencies. It also provides a framework to help local water managers prepare long term water conservation and management plans. It includes current basic information to help in prioritizing and making decisions. This plan will help legislative and executive policy makers understand the broad and intricate aspects of water management. It addresses policy issues and, where appropriate, makes specific recommendations to resolve them. The *Utah Lake Basin Plan* will help accomplish the mission of the Division of Water Resources to “promote the orderly and timely planning, conservation, development, utilization and protection of Utah’s water resources to enhance the quality of life for the citizens of the state.”

3.2.3 Organization

The Division of Water Resources carries out state water planning under authority of the Board of Water Resources. A state water plan coordinating committee, composed of state agencies with water-related missions assisted in preparation of this plan. A steering committee consisting of the chair and vice chair of the Board of Water Resources, the executive director of the Department of Natural Resources, and the director and assistant director of the Division of Water Resources provides policy, resolves issues and approves plans before acceptance by the board. The local board member is invited to participate with the steering

committee. In addition, other state and federal agencies participate as cooperating agencies. They have expertise in various fields to help with plan development.

A statewide local advisory group provides information on various aspects of planning and helps with plan review. This group represents various interests and geographic locations. Section 3.4, The introduction of the *1990 State Water Plan*, lists members of the steering committee, coordinating committee, cooperating state and federal agencies, and the statewide local advisory group.

A local basin planning advisory group provides advice, review and decision-making. The group represents various local water interests and geographical areas within the basin.

3.2.4 Process

Four drafts of the *Utah Lake Basin Plan* were prepared for review and approval: 1) In-house, 2) committee, 3) advisory, and 4) public review drafts. Revised drafts may occur whenever warranted. After the division receives comments from all reviewers, it prepares the final report and distributes it to the public. The final report provides information to help state and local agencies and the people they serve.

3.3 Basin Description

Figure 3-1 shows the Jordan River Basin and the Utah Lake Basin. These basins are unique in Utah because of the density and number of people drawing from the water supply. They are also hydrologically connected by the Jordan River whose source of water is in the Utah Lake Basin, and by the Salt Lake and Jordan Aqueducts and the Provo Reservoir Canal. To better understand the problems and alternative solutions, a brief description of the Jordan River and Utah Lake basins is presented. The Jordan River Basin includes all of Salt Lake County. The Utah Lake Basin consists of most of Utah and Wasatch counties, parts of Summit and Sanpete counties, and eastern Juab County. A tiny portion of Carbon County is also in the Utah Lake Basin. Salt Lake and Utah counties are part of the Wasatch Front Metropolitan Area where most of the state's population is found. Salt Lake City, Provo and Orem are the largest commercial centers in the two basins. Land status for both basins is shown in Table 3-1 along with acreages in both basins. The remaining discussion will apply only to the Utah Lake Basin.

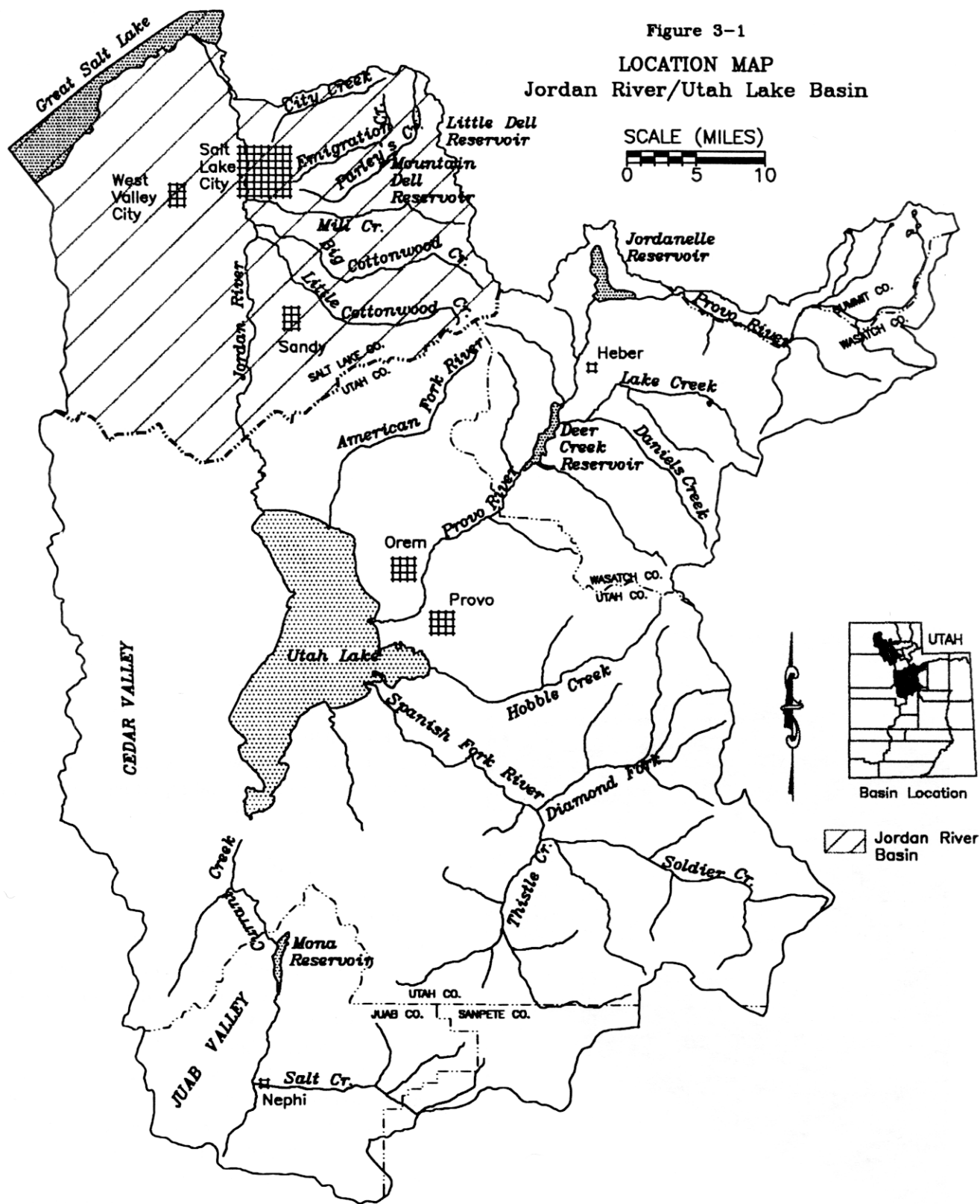
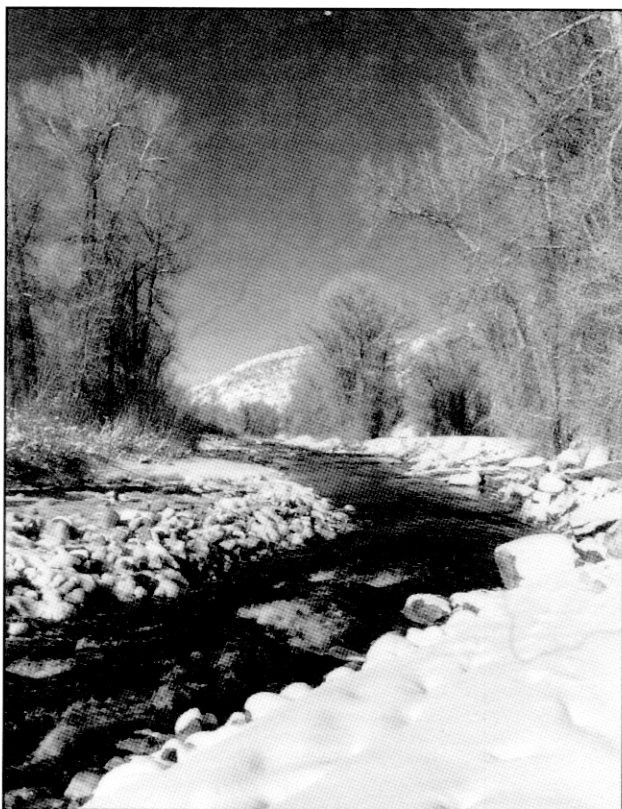


Table 3-1 BASIN LAND OWNERSHIP AND ADMINISTRATION			
Status	Jordan (acres)	Utah Lake (acres)	Total (acres)
Private	372,730	866,400	1,239,130
State	33,640	233,900	267,540
Federal	108,830	844,800	953,630
Total	515,200	1,945,100	2,460,300

3.3.1 Drainage Area and Topography

Utah Lake is the destination of nearly all rivers and streams in the drainage, and the source of the Jordan River. Provo River, with headwaters on the western slopes of the Uinta Mountains, is the primary tributary of Utah Lake. Jordanelle and Deer Creek reservoirs provide on-stream storage for municipal, industrial, irrigation and recreational purposes. Mona Reservoir provides storage for irrigation in Goshen Valley. Utah Lake provides storage for Jordan River irrigators.

Water is imported from the Weber River Basin through the Weber-Provo Canal. Water is imported from the Uinta Basin through the Duchesne Tunnel and



Provo River near Woodland

from the enlarged Strawberry Reservoir through Syar Tunnel. Water from Syar Tunnel enters Sixth Water Creek, a tributary of Diamond Fork. Diamond Fork is a tributary of the Spanish Fork River which empties into Utah Lake. Soldier Creek and Thistle Creek also contribute water to the Spanish Fork River. Water is also imported from the Strawberry River drainage to Daniels Creek by the Hobble Creek and Strawberry ditches. This will end in two to three years when the Daniels Replacement Project and the Wasatch County Water Efficiency Project are complete.

Hobble Creek (not Hobble Creek Ditch) enters Utah Lake near the Provo Airport. Beer Creek is a minor tributary which feeds into the lake south of the mouth of Spanish Fork River.

The Utah Lake Basin is bounded on the north by the Traverse Mountains, Wasatch Range and Uinta Mountains (see Figure 3-2). The Uinta Mountains and the Wasatch Plateau bound the east side of the basin. The Wasatch Plateau and the Wasatch Range bound the south side, while the west boundary is formed by the East Tintic and Oquirrh mountains.

3.3.2 Climate

Mean annual temperatures range from 37.8 to 52.2°F. Mean monthly maximum temperatures reach 92.8°F in July and the mean monthly minimum is as low as 3.1°F in January. Elevations vary between 4,475 feet above sea level at Jordan Narrows to 11,928 feet at Mt. Nebo. Frost free days are from 32 at Thistle to 184 near Geneva Steel in Orem. See Table 3-2.

Precipitation goes to 60 inches on high mountain peaks. Figure 3-3 shows the National Oceanic and Atmospheric climatological reporting stations, and Figure 3-4 shows annual precipitation.

3.3.3 Physiography and Geology

The Utah Lake Basin is unique among drainage basins in the state in that it includes portions of three physiographic provinces: the Basin and Range, Middle Rocky Mountains and Colorado Plateau provinces.

All areas in the Utah Lake Basin that are west of the Wasatch Range (Cedar Valley, Utah-Goshen Valley, and Northern Juab Valley) are included in the Basin and Range Province. The distinguishing characteristics of this portion of the Basin and Range Province are typical of the province as a whole. These characteristics include the occurrence of isolated, subparallel mountain ranges which rise abruptly above the adjacent valleys. The ranges are typically block faulted, being bounded

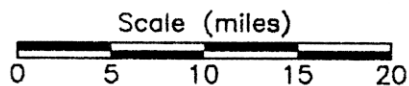
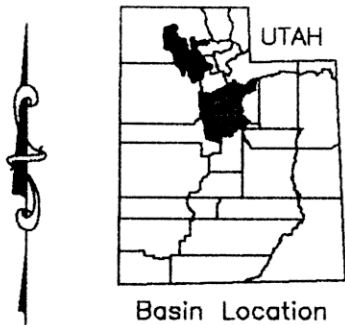
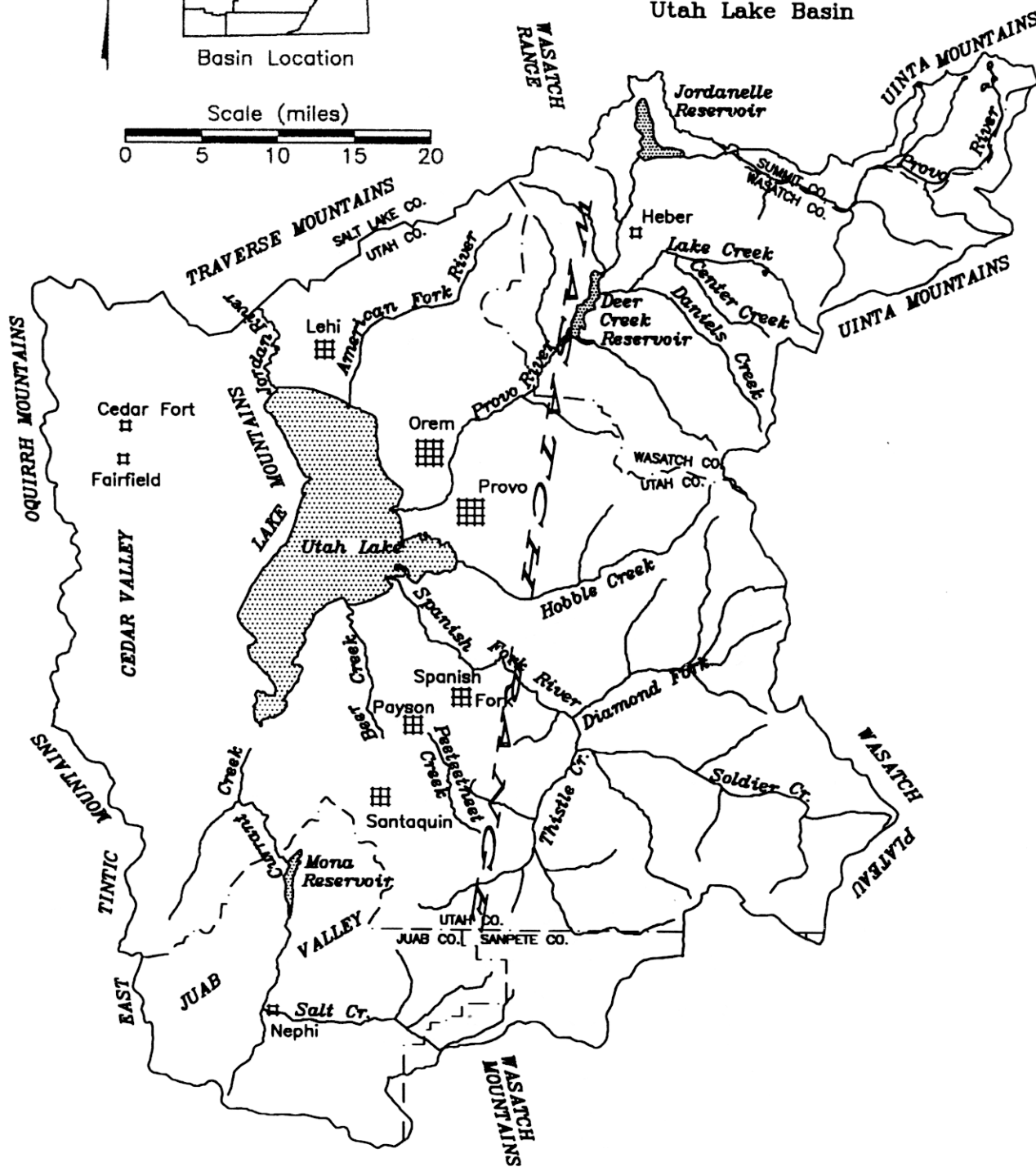


Figure 3-2

LOCATION MAP
Utah Lake Basin



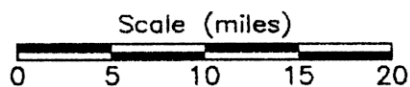
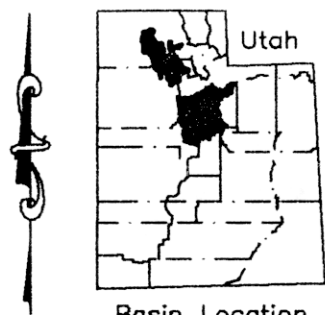
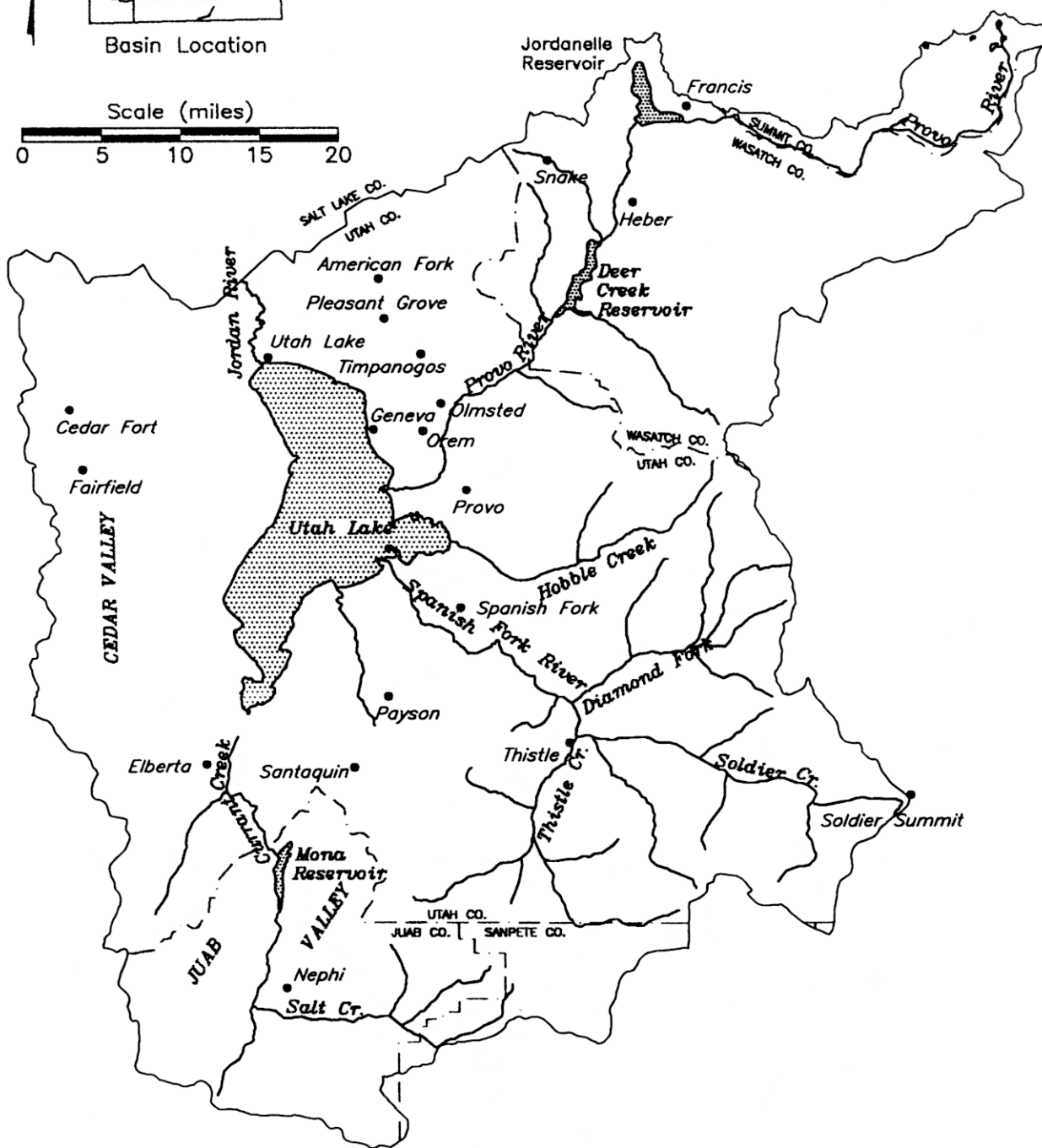


Figure 3-3

CLIMATOLOGICAL REPORTING STATIONS Utah Lake Basin



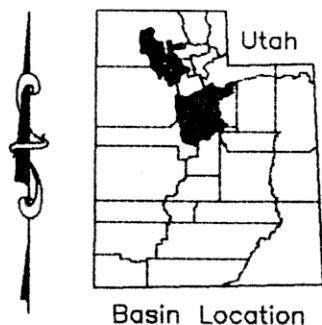


Figure 3-4
ANNUAL PRECIPITATION
Utah Lake Basin

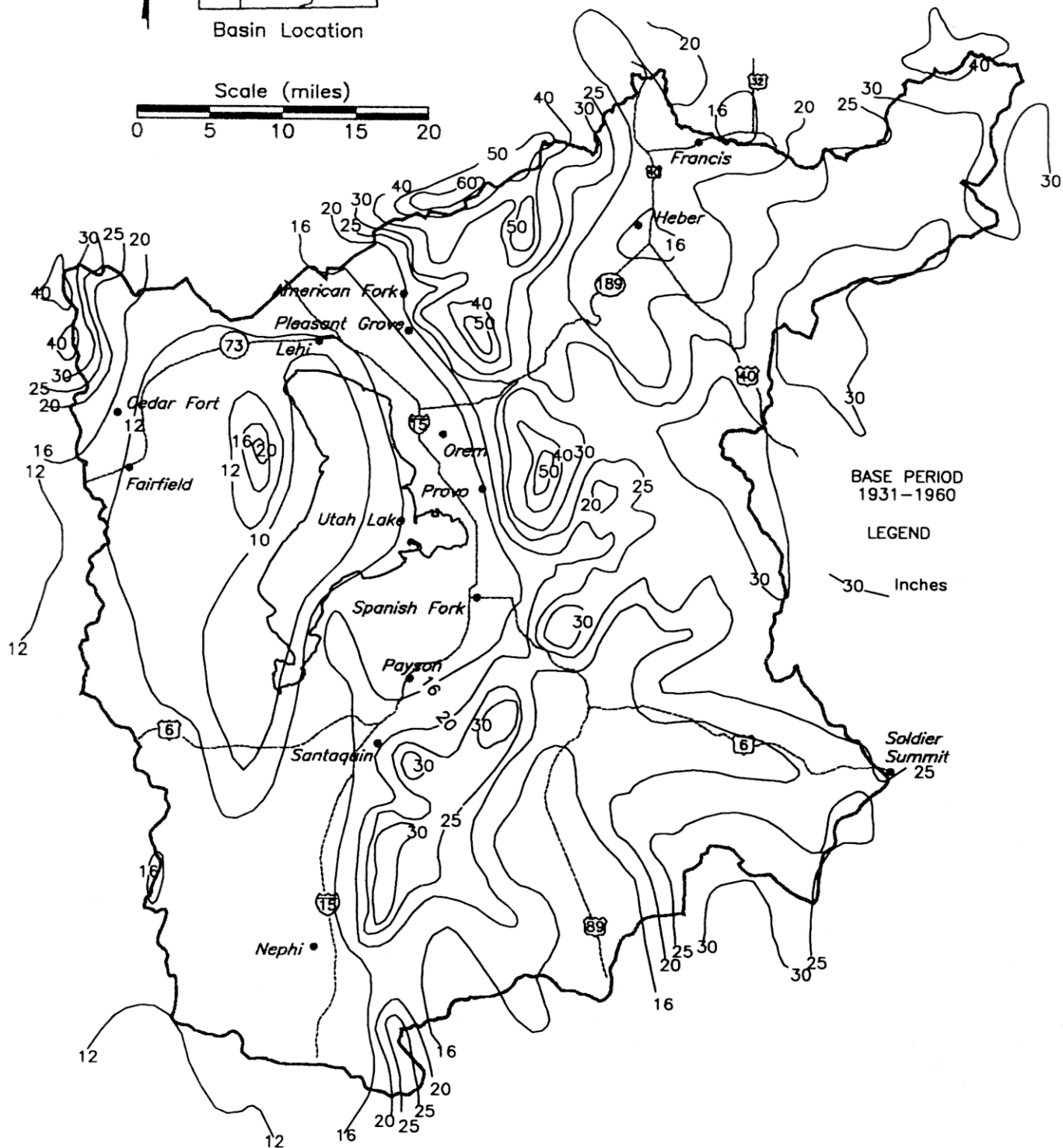


Table 3-2
MEAN TEMPERATURES AND PRECIPITATION

Station	January		July		Mean Annual (°F)	Frost Free Days	Annual Precipitation (inches)
	Max. (°F)	Min. (°F)	Max. (°F)	Min. (°F)			
Lower American Fork	37.8	20.3	90.5	62.6	52.2	173	16.25
Elberta	36.8	15.8	92.7	58.3	44.9	134	11.41
Fairfield	37.1	10.2	88.9	50.9	46.7	94	12.39
Geneva Steel	38.2	21.8	90.7	62.9	51.9	184	8.98
Nephi	39.1	16.0	92.8	57.6	50.5	138	14.53
Heber	34.0	8.4	86.5	48.4	44.5	90	16.01
Olmsted Power	37.3	18.7	91.0	59.0	51.4	165	20.72
Orem Treatment	33.3	15.4	89.2	61.0	50.8	178	13.17
Pleasant Grove	37.8	18.5	90.2	58.2	50.7	151	17.10
Provo BYU	37.1	18.6	92.5	59.8	49.6	173	13.15
Santaquin	37.9	15.8	90.4	59.5	49.9	144	18.46
Snake Creek Power	33.3	9.7	84.5	45.9	43.1	86	22.01
Soldier Summit	28.2	3.1	80.0	41.2	37.8	48	10.97
Spanish Fork	41.6	18.7	92.7	58.2	51.4	148	13.16
Thistle	36.7	3.5	89.8	42.4	43.1	32	15.58
Timpanogos Cave	33.0	19.1	90.6	57.2	48.9	154	25.87
Utah Lake Lehi	35.6	14.6	89.7	55.7	48.5	133	11.51

Source: Utah Climate, 1992

by normal high angle faults. Internal drainage characterizes the basins so that the valley floors represent the local base level which is sometimes occupied by a lake or playa. Geologically, the ranges exhibit mostly Paleozoic rocks while the valleys contain Quaternary age sediment eroded from the surrounding mountains.

The Wasatch Range and Uinta Mountains are part of the Middle Rocky Mountain Province. These mountains have the highest elevations in the Utah Lake Basin. The high and heavier snow packs found here give rise to the Provo River, which is one of the major drainages, and is the major source of water to Utah Lake. Geologically, this part of the Middle Rocky Mountain Province is made up of Paleozoic and Pre-Cambrian rocks, while the intermontane valleys (Heber, Round and Thistle) contain Quaternary age sediments.

The remaining area of the Utah Lake Basin located south of the Uinta Mountains and east of the Wasatch Range is part of the Colorado Plateau Province. Tributaries to the Spanish Fork River head in this area, made up mostly of the Wasatch Plateau.

Geologically, the area is mostly composed of Tertiary and Mesozoic rocks, see Figure 3-5.

3.3.4 Soil and Land Use

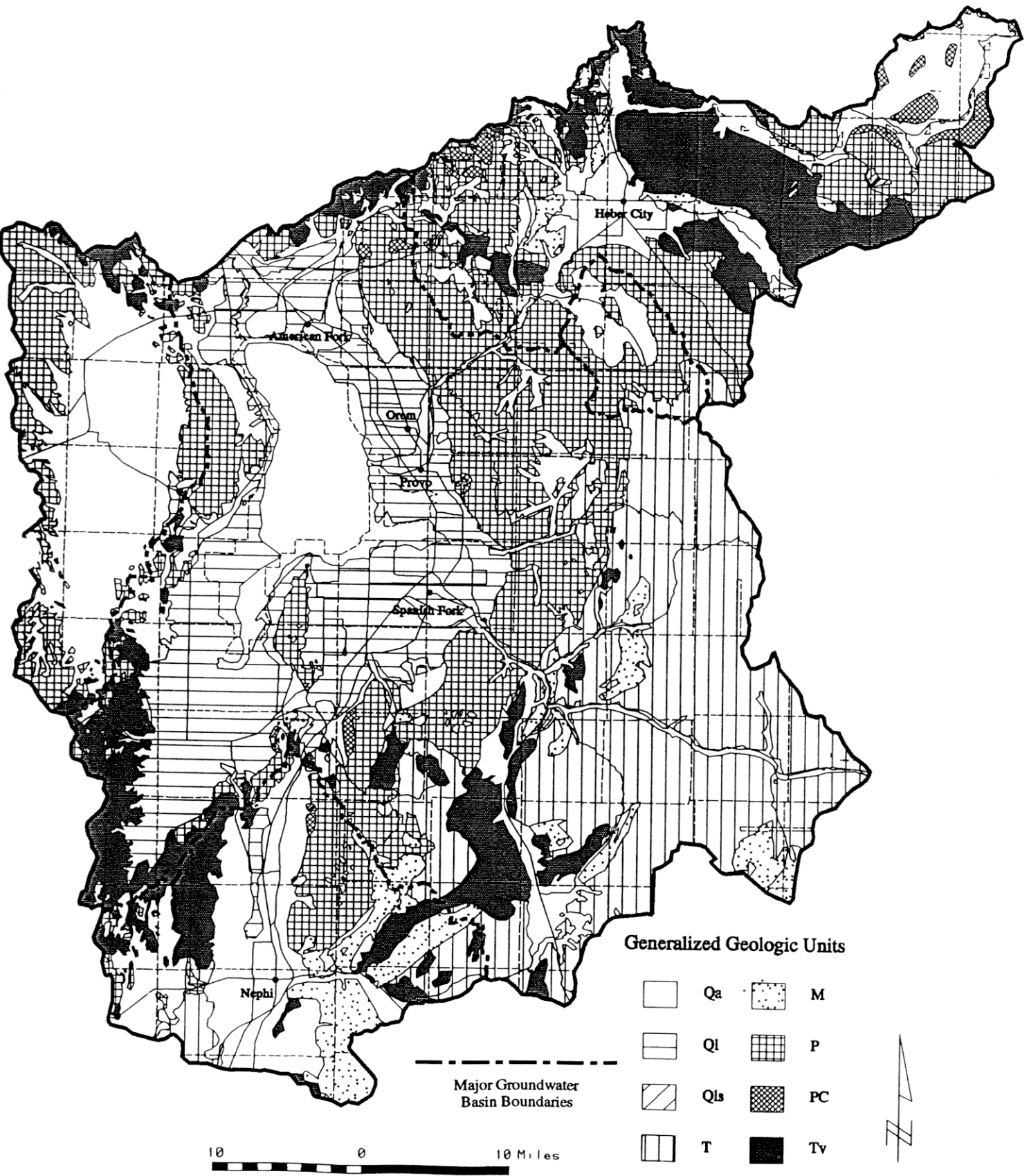
The basin covers approximately 1,945,100 acres. Land uses include irrigated and dry land agriculture, open water and riparian, residential, industrial, and other urban uses. The rest of the basin is in forest and range lands with vegetative cover shown in Table 3-3.

Soils in Heber and Round valleys are mostly formed in alluvium from mixed sedimentary rocks on foothills, mountain slopes and alluvial fans. Most are well drained. Some are poorly drained and are used mostly for summer pastures.

Utah Valley and Goshen Valley soils range from well drained to poorly drained on the lake terraces. Soil types here range from fertile loams to saline-alkali clays. Most soils at the lower elevations support agricultural crops except for the lowest areas around Utah Lake.




Soils in the Fairfield to Nephi area vary widely in their potential for major land uses. About 5 percent are used for irrigated crops, mainly alfalfa, wheat, barley,

Figure 3-5
GENERAL GEOLOGY
Utah Lake Basin





UTAH LAKE BASIN GENERALIZED GEOLOGIC UNITS


Quaternary

-  Qa Unconsolidated deposits of alluvium, colluvium, wind blown, and glacial origin.
-  Q1 Unconsolidated deposits of lake or playa origin.
-  Q1s Landslides


Tertiary

-  T Weakly to semi-consolidated sedimentary basin-filling rocks of the Salt Lake, Duchesne River, Uinta, and Green River Formations and the Flagstaff Limestone.
-  Tv Igneous rocks of Tertiary age; includes the Little Cottonwood and east Tintic intrusives, also the Keetley, Traverse Mountain, Tintic and Long Ridge area volcanics.


Mesozoic

-  M Consolidated sedimentary rocks; locally includes the North Horn, Price River, Indianola, Morrison, Arapahoe Shale, Nugget, Ankerite, and Thayne Formations.

Paleozoic

-  P Consolidated sedimentary rocks locally includes the following formations; Park City, Diamond Creek Sandstone, Kirkman Limestone, Oquirrh Group, Manning Canyon Shale, Great Blue Limestone, Humboldt, Deseret Limestone, Gardiner Limestone, Fitchville, Pinyon Peak, Victoria, Bluebell Dolomite, Fish Haven Dolomite, Opohonga Limestone, Ajax Dolomite, Maxfield Limestone, Ophir, and Tintic Quartzite.

Precambrian

-  PC Precambrian sedimentary and metamorphic rocks locally includes the following formations; Mutual, Mineral Fork Tillite, Inkoma, Uinta Mountain Group, and metamorphic complex of Mt. Nebo.

corn silage and a few orchards. This irrigated land is scattered throughout the area, but it is concentrated mainly around Nephi. About 3 percent of the land is used for dry crops, 1 percent is for woodlands, and about 85 percent is used as rangeland. See Figure 3-6.

3.3.5 Land Status

The federal government administers about 43 percent of the 1,945,100 acres of total land area in theUtah Lake Basin. The state administers 12 percent and 45 percent is privately owned.

Table 3-4 shows land ownership and administration for the Utah Lake Basin by county. Table 3-5 shows the breakdown of federal ownership, by agency, in each county.

Federally administered land is under the jurisdiction of five agencies, the Forest Service, Bureau of Land Management, National Park Service, U.S. Army and the Bureau of Reclamation.

3.4 Water-Related History

The history of the Utah Lake Basin provides an interesting backdrop for existing conditions. The first recorded history of white men to explore this basin begins with the Dominguez-Escalante Expedition. Led by New Mexico-based Catholic priests, the purpose of the journey in 1776 was to find a new route from Santa Fe to California. Journal entries in September 1776 find the group reaching the present site of Strawberry Reservoir and descending by way of Sixth Water Creek

Table 3-3 VEGETATIVE COVER AND LAND USE		
Cover/Use	Acres	Area (percent)
Barren rock, sand playas and misc.	14,300	.74
Alpine, conifer and aspen	400,600	20.6
Oak	311,800	16.0
Mountain brush, juniper, sagebrush and greasewood	681,900	35.1
Scattered native vegetation	129,800	6.7
Riparian, marshlands and wetlands	49,700	2.6
Open water (includes Utah Lake)	91,200	4.7
Urban	50,400	2.6
Agricultural	215,400	11.1
Total	1,945,100	100.0

Table 3-4 LAND OWNERSHIP AND ADMINISTRATION							
COUNTY							
Status	Carbon	Juab	Sanpete	Utah (acres)	Summit	Wasatch	Total
Private	400	107,900	45,100	547,900	7,000	158,100	866,400
State	0	17,300	600	180,400	500	35,100	233,900
Federal	300	84,600	9,700	576,800	42,000	131,400	844,800
Total	700	209,800	55,400	1,305,100	49,500	324,600	1,945,100

Figure 3-6
LAND USE
 Utah Lake Basin

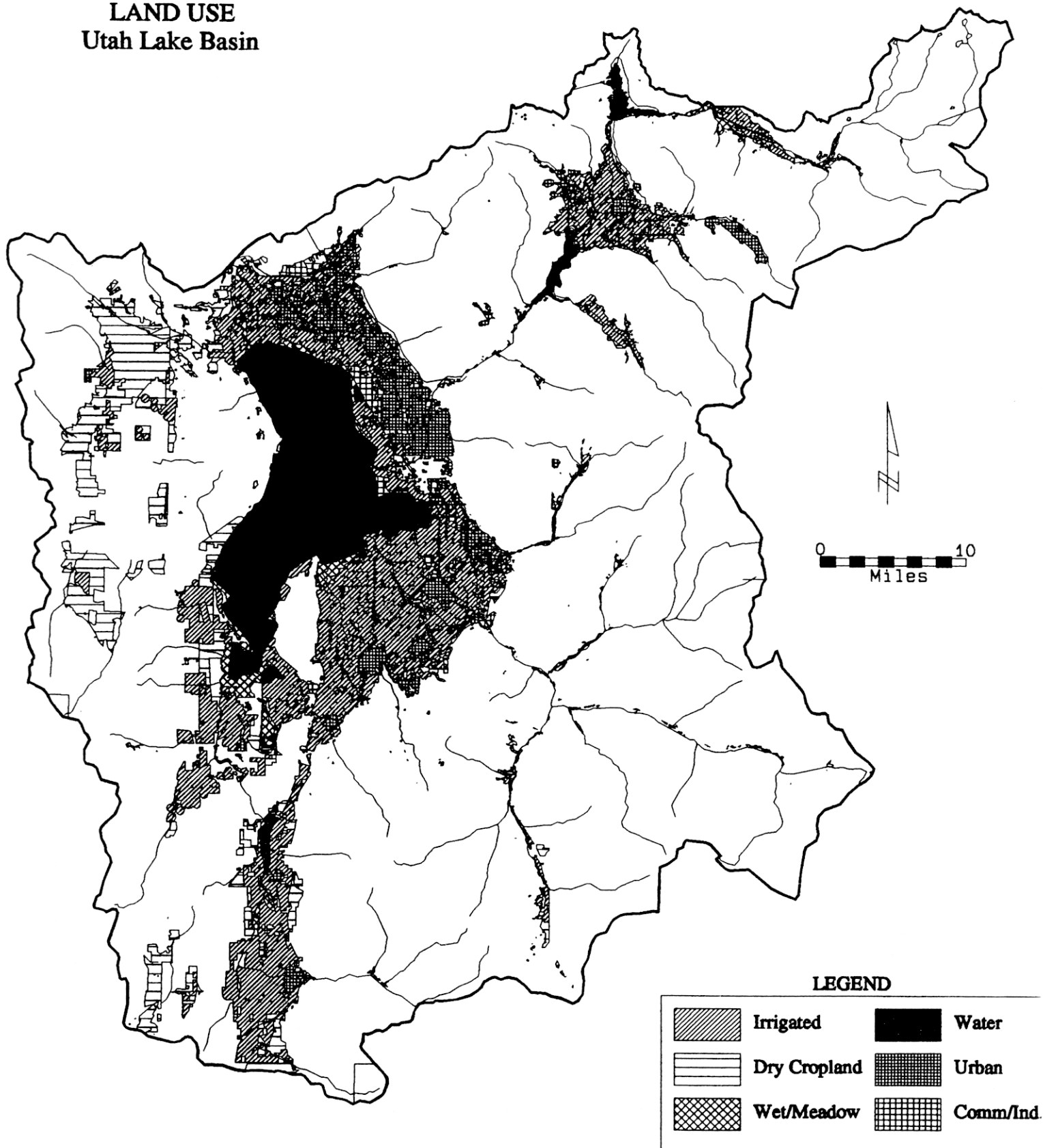


Table 3-5 FEDERAL LAND ADMINISTRATION							
Agency	COUNTY						Total
	Carbon	Juab	Sanpete (acres)	Utah	Summit	Wasatch	
Bureau of Land Management	0	29,250	1,760	95,000	200	4,050	130,260
Forest Service	300	37,150	7,940	425,430	41,800	118,850	631,470
Wilderness Areas ^a	0	18,200	0	38,550	0	0	56,750
National Park Service	0	0	0	230	0	0	230
U.S. Army	0	0	0	17,590	0	0	17,590
Bureau of Reclamation	0	0	0	0	0	8,500	8,500
Total	300	84,600	9,700	576,800	42,000	131,400	844,800
^a Administered by U.S. Forest Service.							

into Diamond Fork, the Spanish Fork River, and eventually to Utah Lake. Escalante's journal describes the four rivers (later named American Fork, Provo, Hobbie Creek, Spanish Fork), the excellent soil, the timber in the nearby mountains, and the abundant waterfowl and fish in and around the lake. Also described is the "other lake" (Great Salt Lake) to the north. "Its waters are harmful and extremely salty, for the Timpanois assured us that anyone who wet some part of the body with them immediately felt a lot of itching in the part moistened."

3.4.1 Pioneer Development

Utah County was one of six counties in the provisional State of Deseret. On March 10, 1849, Brigham Young sent 30 men from Salt Lake Valley to begin settlement in Utah Valley. They named this county after the Ute Indians who lived here at the time of settlement. A low dam was placed across Utah Lake's outlet to the Jordan River in 1872, creating the first storage reservoir. They built a pumping plant in 1902 so that the lake water could be lowered below the outlet elevation. The pumping plant has been modified and enlarged several times. Its present capacity is about 1,050 cfs, and it can lower the lake level eight to 10 feet below the compromise elevation (4,489.045 feet).

Wasatch County was settled in 1858 when William M. Wall, George W. Bean and Aaron Daniels built ranches in Heber Valley. Wasatch County was established in 1862. Heber City, elevation 5,593, is the county seat.

Three canals diverted water from the Strawberry River drainage to Daniels Creek. Two canals, Strawberry River Canal and Willow Creek Canal, were commingled in 1954 to form a single canal entering Daniels Creek. Hobbie Creek Ditch is the third diversion. They will all be abandoned when water becomes available to this area from the Jordanelle Reservoir under the Central Utah Project. Fifteen small reservoirs at the headwaters of the Provo River were constructed about 1910 by several different interests, including the Provo Reservoir Water Users Company, Provo City, and upper basin irrigation companies located in the Francis and Heber Valley areas. And several small reservoirs were built in Heber Valley.

The Deseret Legislature established Juab County in 1849, but it was not officially organized until 1852. Juab County originally extended to the present western boundary of the state of Nevada. Nephi is the population center and county seat. Most of the farms and ranches in this part of the basin are in Juab Valley around Nephi. Near Eureka, miners extracted large deposits of

gold, silver, lead, copper and zinc from the East Tintic Mountains. Little mining activity remains.

The first permanent settlers in the Nephi area of Juab County arrived in 1851 when the Timothy Bradley Foote family settled on the banks of Salt Creek. In the spring of 1852, a diversion dam was constructed on Salt Creek and ditches were dug to convey the water to the fields.

The Mt. Nebo Land and Irrigation Company constructed Mt. Nebo Dam on Currant Creek in 1895 to form Mona Reservoir. Surplus water from Currant Creek was stored for irrigation of 15,000 acres of land in Goshen Valley. Subsequent droughts drove most of the farmers into receivership by 1903. The reservoir eventually filled again, and in 1905 the irrigation company was sold and the name changed to the Utah Lake Land, Water, and Power Company.

The Mosida area was opened for settlement in 1909 by farmers from Utah County and several Midwestern states. They pumped water from Utah Lake for up to 50,000 fruit trees planted between 1910 and 1913. They planted several thousand acres of alfalfa and small grains.

3.4.2 Federal Water Projects

During the 20th century, three major water projects constructed by the Bureau of Reclamation have had a major impact on this basin. They are the Strawberry Valley Project, the Provo River Project and the Central Utah Project.

The Strawberry Valley Project, which diverts water from the Uinta Basin to the Bonneville Basin, is one of the earliest federal reclamation developments. Construction began in 1906 and water was first used in 1915. Water was collected in a reservoir with 270,000 acre-feet active capacity. The reservoir sits behind the Strawberry Dam constructed on the Strawberry River, a tributary of the Duchesne River. Indian Creek Dike and Currant Creek Feeder Canal were also constructed. Soldier Creek Dam, now the main storage facility of the Central Utah Project, enlarged Strawberry Reservoir to 1.1 million acre-feet.

Deer Creek Reservoir, the principal feature of the Provo River Project, was completed in 1941. It has an active storage capacity of 152,560 acre feet. Approximately 120,800 acre-feet of Provo River water is stored in Deer Creek Reservoir, which includes 17,400 acre-feet by exchange of return flows to Utah Lake from imported water. The remaining normal flows and flood flows are required for prior rights on the

Provo River and in Utah Lake. Deer Creek Reservoir also stores water imported from the Weber and Duchesne rivers.

The Weber River Project, constructed in 1928-31, includes the nine-mile long Weber-Provo Diversion Canal that was built to a capacity of 210 cubic feet per second (cfs). It was enlarged to 1,000 cfs under the Provo River Project. It conveys surplus high flows and some exchange waters from the Weber River nine miles south through Kamas Valley, delivering it to the Provo River near Francis. The Weber-Provo Canal is a facility of the Provo River Project. Provo River Project water is also imported to the Provo River from the Uinta Basin through the Duchesne Tunnel for storage in Deer Creek Reservoir. This tunnel, completed in 1953, diverts water from the North Fork of the Duchesne River, a tributary of the Green River which is tributary to the Colorado River. The tunnel is six miles long and is under a spur of the Uinta Mountains. It discharges into the main stem of the Provo River upstream from Woodland. Its capacity is 600 cfs.

The Provo Reservoir Canal was enlarged under the Provo River Project to 550 cfs at the diversion and 350 cfs at the point-of-the-mountain. This canal is used to convey agricultural and municipal water to northern Utah County and to Salt Lake County. The Salt Lake Aqueduct was constructed as part of the Provo River Project and transports water from the Provo River Basin to the Salt Lake Valley. It went into operation in 1952, and is used to convey water stored in Deer Creek Reservoir for urban purposes to Utah County users, the Metropolitan Water District of Salt Lake City, and the Salt Lake County Water Conservancy District.

The Bonneville Unit of the Central Utah Project is located in central and northeastern Utah. For planning and coordination purposes, the Bonneville Unit is divided into six systems according to location and function. These systems are: 1) the Starvation Collection System, 2) the Strawberry Collection System, 3) the Ute Indian Tribal Development, 4) the Diamond Fork System, 5) the Municipal and Industrial (M&I) System, and 6) the Spanish Fork Canyon-Nephi Irrigation(SFN)System. The Bonneville Unit includes facilities to develop and more fully utilize waters tributary to the Duchesne River in the Uinta Basin. This unit also facilitates a transbasin diversion from the Colorado River Basin to the Bonneville Basin. It also includes features to better use local water resources and facilities to distribute project water in the Bonneville Basin. The project water supply will be used for

municipal and industrial purposes and irrigation in both basins. The project will also provide flood control, recreation, fish and wildlife measures and, potentially, power generation.

3.4.3 Water Districts

All land in the Utah Lake Basin is within the boundaries of the Central Utah Water Conservancy District except a small piece of Carbon County. Five metropolitan water districts provide part of the water supplies for some incorporated cities, and several water improvement districts serve some unincorporated areas. Section 6 provides more information on water management institutions. ❖ ❖